

minutes to help settle the cutting. (I do not heavily water them in). After the beds are filled I usually only mist for a couple minutes morning and evening, unless there are some exceptionally hot days.

IN SEARCH OF NEW PLANTS: PLANT INTRODUCTION, METHODS, AND APPLICATION

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The frost-free regions in the northern parts of the North Island of New Zealand have been a challenge to many horticulturists in the past century, as the climate in this zone has unique qualities, being without extremes in temperature. This allows plants of both a tropical and temperate type to be grown in close relationship.

In early times, pioneers introduced both food bearing and ornamental plants into New Zealand, from the mother country — England. Most of these early introductions thrived, although some of the temperate fruits did not thrive in northern regions of the country, due to lack of winter chilling. In the last fifty years, many new plants have been introduced, mainly those that grow well in this sub-tropical region. The Kiwifruit, brought into New Zealand in the first decade of this century, has only become a commercial success in the last twenty years. Other lesser known fruits have also become commercial fruits in New Zealand, such as the feijoa, (*Feijoa sellowiana*), the tamarillo, (*Cyphomandra betacea*), the pepino, (*Solanum muricatum*), and many species of citrus. There are still many plants, unknown in New Zealand, that warrant introduction and evaluation. The author has been directly involved in plant introduction since 1976.

Why more plant introduction? Early plant explorers who travelled to foreign lands were hampered by difficult transportation and inadequate collection facilities. Places visited were often pristine, presenting an enormous challenge to collect the many unknown plant forms. Today a reverse situation exists, where transportation is instant, and plants may be sent over large distances in a relatively short time. What is alarming however, is that many natural plant habitats are rapidly disappearing, as the rate of plant removal and clearing increases every year. In spite of modern communications there are many

plants that are little known and in some cases undescribed. Often plant species simply vanish in the face of the onslaught of forest destruction.

It is important therefore, that plant introduction should be encouraged, to save plants from being lost altogether. Instances have occurred where introduced plants perform better in the country of adoption than in their native habitat, hence improving the changes of survival of the species. My plant introduction programme was planned so as to introduce plants most suited to our northern New Zealand climate. The climate of the high altitude regions in the equatorial regions of South America closely resembles that of New Zealand. In order to carry out such a programme, close planning is required.

Plant exploration, aspects of planning. Unprepared travel to a foreign country rarely results in successful plant introduction. Plants are intimately associated with people. In order to learn more about the plants of a country it is equally important to study about the people that live in these areas.

1. *Study the geography of the country to be visited.* Land contour often decides what plant species may be expected. Factors such as mountains, lakes, plains, etc. create ecological niches for certain plant species.

2. *Political history, economic, and ethnic studies.* These factors often decide to what degree plant life has been preserved or destroyed.

3. *Language study.* In the case of South America, it is essential to have a working knowledge of Spanish. This may take about 3 years of study in which to become adequately conversant. It takes a lot of motivation to maintain the will to study in addition to other commitments in one's working life.

4. *Study of known plant species in the country to be visited.* Apart from rather encyclopedic references, little has been described about plants in western South America. References of value may be found in literature, mostly in Spanish, hence the ability to translate is of great value. Knowledge in taxonomy is necessary to assist in the identification of plant species unknown to the collector.

5. *The establishment of reliable contacts in order to establish a correspondence network.* Much trouble can be spared when useful information is gathered from correspondents who are familiar with the areas to be visited. Find out about the customs and life styles of the people you will come into contact with. Much embarrassment can be caused by one inadvertent remark. Any assistance in travel arrangements can save much time. Local knowledge of interesting collection areas can often be found in the districts.

Once all your plans fall into place, consider the mechanics of plant collecting.

1. *Permission to collect wild plants.* Some countries have strict rules about the collection of native plants.

2. *Pre-arrange the method of transport once the plants have been collected* — for instance, in the case of New Zealand it is quicker to route the consignment via Europe than to try to fly it across the Pacific. Flights across the Pacific to New Zealand are few and far between from South America.

3. *Make arrangements with the Ministry of Agriculture and Fisheries in New Zealand to obtain importation permits.* Some plants are prohibited or restricted for entry into New Zealand.

4. *Have suitable post entry quarantine facilities.* The success of plant introduction often depends on the ability of the importer to care for the material imported. This includes the monitoring for possible plant diseases and pests.

Tools for collection — Secateurs, a knife, a simple digging tool, plastic bags, foam rubber to keep collected specimens moist, rubber bands, ties, plant labels, felt pens and, of course, a notebook. A good camera with various lenses, binoculars, magnifying glasses and a light carrying case for it all are necessary.

A slide presentation can be summarised as follows: — Photographs were shown of native plant collections in Colombia. Those of the Jardín Botánico and Bogotá provided a wide range of plants which would be difficult to find if a collector had to travel throughout the country in order to see the same range. The National University of Colombia in Bogotá has an active plant propagation programme with aims to multiply native plant species, now becoming rare in Colombia.

The author visited fruit orchards in Ecuador growing crops such as babaco, (*Carica* × *heilbornii*, *C. pentagona*), cherimoya, (*Annona cherimola*), tamarillo, (*Cyphomandra betacea*) — important crops in that country but little known elsewhere. Vegetation changes abruptly according to altitude. Distinct “fajas” or zones offer different plant species. Areas visited were near Baños, Ecuador, between 1500 m to 2000 m altitude. Many forest species of tropical nature were found — palms, cecropia, orchids, bromeliads, and many species of the Araliaceae to name a few; 2000m to 2700m offered different plant species, often hardier forms of those growing at lower belts, a typical example being the cecropia. Those growing in tropical regions will not thrive in New Zealand, yet those collected at 2500m altitude grow well. This also applies to tropical forms of tropical fruits. Some forms will reach into higher altitudes

which make them interesting for introduction into a climate such as we have in New Zealand. In the family of Caricaceae, a number of species exist in the mountains of Ecuador which have now been established in New Zealand as commercial cultivars. Bromeliads and orchids are particularly striking in this altitude range.

Above 2700m to 4000m the vegetation becomes more sparse. Such areas are termed the Páramo. Often shrouded in mist and cold, heathlike plants exist with a stature no more than 2 metres. The Family Compositae is very common and so are ferns and lichens. One fruiting plant, *Vaccinium floribundum*, carries numerous small berries, refreshing in flavour.

The botany of the west coast region of South America is still incomplete. The rapid disappearance of the native vegetation offers a challenge for those adventurous enough to visit these areas. Plant life in South America is extremely rich and varied.

VEGETATIVE PROPAGATION OF RADIATA PINE

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Abstract. Systems used for vegetative propagation of *Pinus radiata* (radiata pine) in New Zealand are briefly described. Mature trees are propagated by cuttings or grafts for the establishment of archives and seed orchards. Several propagation techniques are being developed for multiplication of scarce seed of the best genetic material. Options include collection of cuttings from young plantation trees, manipulation of seedlings in nursery stool beds, and micropropagation.

INTRODUCTION

Radiata pine plantations traditionally have been established using seedlings. This programme has used up to 5000 kg of seed each year, with over $\frac{3}{4}$ of it being improved seed from open-pollinated seed orchards.

Further significant improvements in tree quality can be made using seed from controlled pollinations between the best parents (12). It would be feasible, but logistically difficult, to produce all New Zealand's requirements by controlled pollinations. An alternative method is to combine a programme of controlled pollination with some form of vegetative propagation (4). Rapid advances are being made in propagation techniques for juvenile planting stock, including collection of cuttings from plantation trees of improved seed origin,